

THE IMPORTANCE OF KNOWING AGE AND SMOKING STATUS WHEN USING STABLE ABERRATIONS TO QUANTIFY EXPOSURE TO ENVIRONMENTAL AGENTS

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Fluorescence *in situ* hybridization with chromosome-specific composite DNA probes ("chromosome painting") is a reliable and efficient method for detecting structural aberrations. Painting is now widely used to quantify chromosome damage in human populations. In one such study (Ramsey *et al.*, 1995, Mutation Res. 338:95-106) we evaluated 91 "unexposed" people ranging in age from birth to 79. We established a baseline frequency of stable aberrations that showed a highly significant curvi-linear increase with age ($p < 0.00001$) that accounted for 70% of the variance among donors. The magnitude of this effect illustrates the importance of understanding the factor(s) that are associated with stable cytogenetic changes that occur with age. Understanding these factors is particularly important for studies which seek to quantify the possible effects of chronic occupational or environmental exposure, because stable aberrations accumulate with age and other lifestyle factors (e.g. smoking), as well as from exposure. Similarly, acute exposures that occurred many years previously may be masked by the accumulation of damage in the subsequent period. We use data from this population to characterize the distribution of stable aberrations by age and pack-years of cigarette smoking. Based on our data, a person who begins smoking 2 packs/day at age 20 will accumulate stable chromosome rearrangements at a rate that is ~30% greater than non-smokers. We also estimate the number of cell equivalents (CEs) to score in order to detect an increase in aberrations above the background level observed in this population. To detect a doubling with 90% power in non-smokers, 7920, 3580, and 1620 CEs must be scored at ages 30, 50, and 70, respectively. For 2-pack-a-day smokers, the corresponding numbers are 6100, 2550, and 1240 CEs respectively. Work performed under the auspices of the US DOE by LLNL contract No. W7405-ENG-48.